

7 027/007

# STATE OF COLORADO

## DIVISION OF MINERALS AND GEOLOGY

Department of Natural Resources

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DEPARTMENT OF  
NATURAL  
RESOURCES

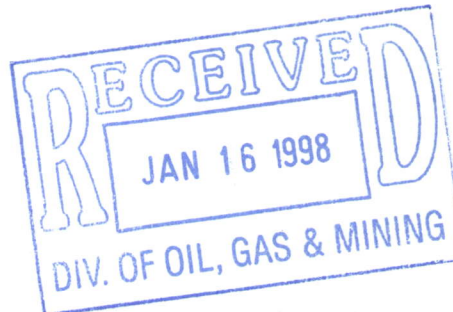
Roy Romer  
Governor

James S. Lochhead  
Executive Director

Michael B. Long  
Division Director

January 13, 1998

Mr. Tom Munson  
DNR-Division of Oil, Gas & Mining  
Minerals reclamation Section  
1594 W North Temple Ste 1210  
P O Box 145801  
Salt Lake City UT 84114-5801



RE: Waste Rock and Spent Ore Testing

Dear Tom,

Following are some comments on your packet of information regarding the Drum Mine in Millard County, Utah. As you know, this Division has no authority over mining outside our own state, so of course I have been careful to address the issue in general ways that are characteristic of Colorado's regulations.

### *Representative sampling and number of samples.*

Colorado requires that waste rock and spent ore be characterized using a "representative sampling method." Representative sampling, in our interpretation, does not require a statistically-based sampling procedure. Rather, it requires that a sample weighted average of all applicable rock types be assessed. Depending on site conditions, these may be sampled as a single, lithology-weighted bulk sample, or bulk samples from a homogeneous rock mass such as a waste rock dump.

### *Backhoe sampling.*

The backhoe sampling method described in the information packet probably would not present a problem if it could be shown that the last (i.e. the uppermost, "worst," most sulfidic) material on the waste rock piles or heap leach pads was the *last* to be extracted from a pit which grew more sulfidic with depth. If that were the case, as it commonly is, then preferential sampling of the uppermost layer would actually bias the sample toward a worst case, and that should prove environmentally conservative.

### *Analytical methods.*

The Nevada Meteoric Water Mobility Procedure, which was developed for Nevada agencies, is a procedure that Colorado operators utilize frequently to characterize the metals leachability of spent ore and waste rock. Like all leach tests, the results cannot be directly applied, so need

interpretation from a mineralogist, geochemist, metallurgist or the like. The results must be interpreted in light of what may happen, chemically, to the water as analyzed between the point of metals leaching to the first applicable compliance point. This often requires a bit of mathematical mixing, geochemical modeling, or hydrological interpretation in order to come up with an applicable answer.

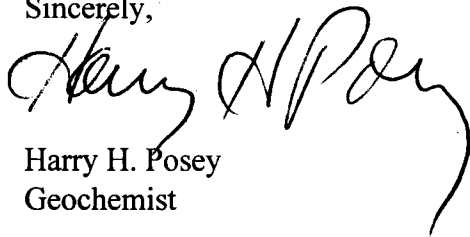
As I mentioned on the phone, the best, most representative analysis of eventual effluent water quality is that which may flow from the toe of a waste rock pile or spent ore pile, which is similar in composition to the rock in question, and which has been inactive for several years. Where such analyses are available, I would recommend applying those results directly, and avoiding the commercial leach tests.

*Cyanide analyses.*

In our phone conversation, you mentioned some analytical results from cyanide analyses. WAD cyanide is generally regarded as the most reliable analysis, followed by total cyanide and trailed by free cyanide analysis. In general, we consider any WAD CN analysis to be representative of the Free CN which may be available to an environmental receptor. Total cyanide, on the other hand, consists mostly of Fe-CN complexes, most of which break down in the environment only with considerable difficulty; furthermore, it takes significant concentrations of Ferrocyanide to affect mammals.

Hopefully, these notes will be of some use. I am returning your materials intact. Thank you for our several interesting conversations. If anything develops regarding an exchange of field trips, please let me know.

Sincerely,

A handwritten signature in black ink, appearing to read "Harry H. Posey", with a long, sweeping flourish extending from the bottom right.

Harry H. Posey  
Geochemist

cc: Bruce Humphries  
Jim Pendleton